メディア教育研究 第8号
Media and Education, 2002, No. 8, 1-13

招待論文

ICT-based Learning Networks and Communities of Practice

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The following paper discusses information and communications technology-based learning networks and communities of practice and how these are serving groups and individuals in developed and developing countries. It suggests that 'information age' organizations are service rather than product oriented, often use temporary configurations and linkages, and are typically organized around networks, teams and processes rather than traditional management and organizational structures. It illustrates how Web-based networks are used to link learners, trainees and professionals nationally and internationally, and how telecentres bring technology, learning and information to remote and disadvantaged communities. It concludes by addressing the issues of technology, cost, evaluation, effectiveness and efficiency in such developments.

Key Words
Learning networks, communities of practice, virtual universities, telecentres, information and communications technology, teaching/learning.

Introduction

In the Indian state of Maharashtra, a farmer accesses the Internet through a village 'facilitation booth' to learn about new agricultural methods, receive up-to-date weather forecasts, gain information on planting, harvesting and the market prices, and thus improve his productivity and avoid exploitation by the middlemen. Elsewhere in India, in the state of Tamil Nadu, village women learn to use the computers in 'village knowledge centres' and are then able to learn more about such critically important issues as childcare and healthcare via the Web.

In rural Uganda, a community ICT-based 'telecentre' is used, not only to access global information and knowledge on the Internet/Web but to collect and disseminate indigenous knowledge on organic farming, the medicinal properties of plants, and traditional birth practices. In the poorest neighbourhoods of Asunción, capital of Paraguay, people can go into the computer-linked community 'telecentres' or 'information kiosks' to familiarize themselves with government and civic affairs and educational opportunities. In anglophone and francophone sub-Saharan Africa, university students learn from scarce course material and specialized teaching staff through a transnational, inter-

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institutional 'virtual university'.

In remote and rural regions of developed nations, such as U.K. and Australia, members of the public can be trained in using computers and the Web at their local telecentres and then use these self-same facilities to undertake fee-for-service online 'telework' for distant clients. In British Columbia, networked 'community skills centres' provide online training for managers, workers, teachers, emergency services personnel and small businesses. In Newfoundland and Labrador, a similar network provides satellite-delivered professional development for doctors, nurses and health educators. In the U.K., Canada, U.S. and other countries, headteachers and teachers are able to share their knowledge, experiences and concerns with their peers via the Internet and the Web and join or create virtual 'communities of practice'.

These are but a few examples of the ways in which information and communications technology (ICT) are bridging the digital divide and opening up new opportunities for networked and collaborative learning.

New organizations and systems for the new millennium

The new millennium is witness to unprecedented global change and growth in international relationships and alliances. Countries and communities are becoming increasingly aware of where they stand socio-economically in relation to others, and where they wish to be in the years to come. There are heightened tensions as economies and the people who run them come under closer scrutiny. Lack of education, social inequality and the digital divide lie at the heart of many socio-economic and political problems and can even threaten national and international stability. The only meaningful and sustainable long-term response to the world's socio-economic and political ills must be to spread knowledge and develop human capacity.

Nobel Laureate Professor Gary Becker estimates that only 30% of the real value of any society lies in its real estate, equities, capital, and natural resources: 70% is vested in the country's human capital. The world needs healthy populations, peaceful and well-governed societies, and transparent and equitable financial, legal and regulatory systems. There is no better way of encouraging and supporting these systems than by providing people with the means to a better lifestyle and livelihood through lifelong education and training.

As nations and organizations move into the 'post-industrial age', the time-honoured ways of organizing society and its institutions are called into question. The institutions of the industrial age, those that Toffler (1980) describes as 'second wave' organizations, were large, hierarchical, permanent, self-contained, top-down, mechanistic, and designed to produce repetitive products and decisions. The socio-economic environment in which they operated was relatively stable and predictable. By contrast, in the post-modern or information age, what Toffler calls 'third wave organizations' are service rather than product oriented. They have to find ways of adapting to volatile and uncertain environments and because of this, they need to be less monolithic, bureaucratic and top-heavy. They are, as Toffler puts it, 'messily open' rather than 'neatly closed' systems, operating through temporary configura-

tions and linkages, both internally and externally. Work is organized around networks, teams and processes rather than traditional managements, departments and physical entities. All who work in this new environment must be open to new ideas and processes and able to work not simply intraorganizationally, but through partnerships that are intermedia, interorganiza tional and often international.

Such then is the pace of change that the old models simply will not work. Our educational institutions were similarly designed for the industrial rather than the information age. The pressures of competition, legislative and technological change, and customer demand are such that fundamental transformations are needed in our institutions and the ways in which we encourage and support education and training.

The rhetoric is for lifelong learning. The reality is that countless millions of dollars are expended on reviews of functions, structures and processes, drives for enhanced productivity and performance, training programs and attendance at conferences and workshops with all too often, little or no transfer of new learning into the workplace. The gulfs between theory and practice, the time and place of delivery and the time and place of implementation, the new advocacies and the realities and cultures of the workplace are simply too great. What is called for is a new infrastructure and form of delivery that blurs the distinction between working and learning.

The ever-increasing popularity of the Internet, continuing improvement in computers and ongoing advances in telecommunications mean that ICT can provide such an infrastructure for education and training. The message is: think global and act local. The challenge is to leverage the opportunities for using the technology and using it well to provide learning networks and communities of practice.

Learning networks

Strong arguments can be mounted for opening virtual doors to the digital age, investing in educational institutions and learning networks, and providing people with the information literacy skills to maximize the learning opportunities. We have the power to help the globally disadvantaged. We have the capability to invest more in education and training. We have the intellectual, financial and technological resources to bring to these activities. If we so choose.

Governments, educational and training providers, NGOs and businesses are increasingly placing their services online, and computers, mobile phones and the Internet are changing peoples' expectations of the extent, speed and cost of information delivery. It is therefore vitally important to ensure that potentially prosperity-generating learning and information should be but a keystroke away, regardless of users' circumstances. ICT should never be looked upon as a 'quick fix solution' to every social or economic problem, but carefully designed in accord with established needs, sound business planning and realistic expectations of what can be achieved within certain timeframes.

Learning networks can bring many benefits to communities and individuals in both developing and developed countries. The concept of a learning network is much more than computers and wired, wireless

or satellite connections. It embodies the idea of just-in-time, just-for-now, and just-for me training. It is a net or matrix meshing different kinds of organization that share common purposes or interests, and it offers a variety of linkages and opportunities for collaborative learning and experience sharing by individuals, groups and organizations that can join, transfer allegiances and leave as they wish.

Such networks can take the form of vast libraries of databases of useful resources, publishing environments where people can present their achievements, and spaces for debate, review and collaboration. The programs and services they offer are flexible and capable of constant modification and updating. The latest development in instructional design, the use of online 'learning objects' (Downes, 2001), also serves to provide an alternative to the traditionally restrictive linear pathways of learning, allowing the users to pursue personal interests rather than labour through schedules of content pre-determined by the providers.

The following examples may serve to illustrate the aims and operations of such learning networks.

The UK National Grid for Learning

The UK National Grid for Learning (NGFL) (http://www.ngfl.gov.uk/) is a Web-based initiative designed to enable school children, 16+ learners, educational institutions, parents, the unemployed, the retired, the socially excluded, and small and medium sized enterprises (SMEs) to link to educational material, discussion forums, local and specialist networks, archives, libraries and museums and galleries. To date £1.9 billion has been expended on this portal, evidencing the UK government's commitment to providing everyone across the country with access to ICT portals and the nation's educational resources. Thus, in the field of education, this portal connects with the national curriculum sites for England, Northern Ireland, Scotland and Wales, sites providing advice and information for parents, sites providing advice and materials for those interested in working with children with special needs, the Welsh, Scottish and Northern Ireland and Scottish virtual teachers' centres, and government information and services for teachers. The network depends upon collaboration and resource-sharing between many kinds of public and private provider and organizations such as the BBC, Channel 4, Toshiba and Cisco who are helping to sustain NGFL's services. However Preston (2001) observes that teachers have yet to make full use of this system. She attributes this to the fact that, to date, ICT teacher education has been skills oriented rather than designed to engage the teachers' intellects and imaginations and that many teachers may still feel more comfortable with the linear essay than the multimedia information yielded by online systems such as NGFL (www.ngfl.gov.uk/).

Communities of practice for teachers

As shown above, the Internet/Web provides unprecedented opportunities for teachers and educational managers to link into national and international networks and join communities of practice to share their knowledge, ideas and concerns and collaborate on educational development

projects. Such approaches can be invaluable for nurturing local capacity and reflective practice in teaching and learning. Navarro & Verdisco (2000) observe that most of the successful innovations in teacher training in Latin America such as Accelerated Learning (Brazil) and PLANCAD (Peru) have been organized around work groups and structured as teacher-to-teacher networks with email or regular mail exchanges, and peer-directed meetings. Fontaine (2000) observes that communicating online can promote more democrat, egalitarian, and less hierarchical forms of interaction and that computer-mediated teacher training allows teachers to gain hands-on familiarity with the tools that many of their pupils will need to master in the modern information age. Jung (2001), reporting on online teacher training programs offered by the Cyber Teacher Training Center and Open Cyber University in Korea, concludes that it is important that the instructional design features authentic cases and encourages interactivity, that the learners have self-directed learning skills, that the tutors are given early training in facilitation skills, and that there is high-speed connectivity.

Examples of national teacher development networks may be seen in, for example, the UK National Grid for Learning /BECTA (www.ngfl.gov.uk), the Swedish SchoolNet (www.skolverket.se/skolnet /english/), the bilingual Canadian School Administrators' Technology Integration Resource (SATIR-RISAT) (www.satir-risat. org) and SchoolNet (www.schoolnet.ca), and Red Escolar, the Mexican School Net (http://www.schoolnet.ca/magazine/pdf /fall-2000.pdf).

Preston (2001) describes MirandaNet, an online international fellowship of about 180 teachers, teacher educators, representatives of educational suppliers and educational officials established through the Institute of Education of the University of London, which enables like-minded professionals to provide or receive mentoring and support in the uses of and advances in ICT in teaching and learning, publish case studies, and so on. She states that this network helps to overcome feelings of isolation, fosters a sense of professional community among teachers, enables peers who find reason to work with other to share their expertise, and forms a nexus between schools, government and industry. MirandaNet ebbs and flows and is occasionally dormant as issues come and go and people join, leave or return in different roles. MirandaNet Fellows are encouraged to start their own independent regional and local networks and these have been created in for example, Bulgaria, the Czech Republic, South Africa, Ireland and Chile. networksww. schoolnet. ca/magazine /pdf/fall-2000. pdf).

Talking Heads (www.ncsl.gov.uk) is another UK initiative, provided by the National College for School Leadership (NCSL). It is an interactive community area of NCSL online designed to facilitate networking, discussion and sharing of common problems by serving and aspiring school heads and managers. Participants can dialogue online in open forums or in communities where membership and audiences are restricted. Each community member is allocated a facilitator who provides guidance on using and contributing to Talking Heads.

International extensions of such concepts may be seen in, for example, the online

workshops, teachers' forums, and guides to ICT of the European Schoolnet(www.eun.org/eun.org2/eun/en/index.html), the UNICEF Teachers Talking About Learning (www.unicef.org/teachers/build.htm), designed for teacher collaboration in developing countries, and the World Bank World Links for Development (WorLD), designed to link students and teachers around the world and create interschool partnerships(www.worldbank.org/wordlinks).

The European Commission recognizes the strategic benefits of ICT for the professional development of teachers and among other initiatives, has funded the three-year Telematics for Teacher Training (T3) project (1996-1998) (www.net2000.zynet.co.uk/t3.html), co-ordinated by the University of Exeter with involvement by the Universities of Dublin City, Geneva, Grenoble, Minho, Oulu, and Utrecht and a wide range of public and corporate sponsoring partners. The T3Centrum Website provided a resource for teacher trainers, modelled best practice in Internet sites, and enabled the universities to provide, among other offerings, a course in telematics for teachers of mathematics, school-based teacher training, and online tutoring for an MEd program.

The UK University for Industry

The University for Industry (Ufi) (http://www. ufiltd.co.uk) is a UK initiative developed in response to a government Green Paper, 'The Learning Age', which set out a vision of 'a learning society in which everyone, from whatever background, routinely expects to learn and to upgrade their skills throughout life'. It is so designed as to add value to the current educational and training system and the constituent public and private training providers by ensuring that expertise, research and commercial know-how, dispersed among these various institutions, are more generally and easily available. It is therefore conceived, not as a new teaching institution competing with existing and emerging providers, but as a national learning network which exploits the latest technologies for learning, brings learners into contact with providers, materials, courses, support services, and each other, and embraces the workplace, the home, and local publicly accessible settings such as libraries and community centres. Ufi's learning services are delivered through the learndirect network (http://www.learndirect.co.uk) which provides access to a wide range of quality assured courses, over 80 percent of which are online, and enables people to fit their learning into their lives, wherever they have access to the Internet—at home, at work, or in one of the more than 1000 learndirect centres.

The Ufi supplies the network by broking educational materials and services from existing suppliers such as universities, colleges, trade unions, publishers, broadcasters and software producers, and promoting their accessibility to learners. It also contracts with providers to provide learning opportunity data from members' databases in England, Wales and Northern Ireland, and 'kitemarks' or franchises the learndirect and other learning centres where people can access the programs and receive support from mentors and teachers.

The need the Ufi is designed to serve is great. It has been estimated that over 7 million people in the UK have a significant

skills deficiency when compared with other European countries. The Ufi aims to help stimulate demand for lifelong learning amongst businesses and individuals, enable UK citizens to improve their basic skills and employment prospects, improve business and industry performance, and use ICT to deliver learning to significant numbers in ways never before possible.

UHI Millennium Institute (UHI)

The UHI Millennium Institute (UHI) (http://www.uhi.ac.uk), formerly known as the University of the Highlands and Islands project, serves a vast and disjointed geographic area of Scotland that spans one-fifth of the UK and is one of the least populated and economically marginal regions in Europe. The UHI was created in 1993 to promote regional economic and social development. It regards itself not as a distance teaching university but as a 'networked series of local opportunities dedicated to personal advancement and human development'. It operates through a decentralized federation of thirteen tertiary institutions, 'learning outreach centres', and public, private and regional development agencies.

UHI currently enrolls 17,000 students, many of whom take higher education courses. The academic program is highly flexible, offering considerable ease of student entry and exit, and credit-based modular programs that allow for flexible full- or part-time study. Heavy reliance is placed upon videoconferencing and the Internet /Web to provide students with access to the academic and administrative resources of the multiple locations and learning centres. UHI students meet regularly with local educational providers and in work groups in their immediate locality as well as learning through distance education and self-paced computerized instruction. Business incubation services will shortly be established on several campuses. The UHI shows that an ICT linked network of existing institutions can be a feasible alternative to creating a new institution, particularly in areas of lower population density (Hopper & Saint, 2000).

The African Virtual University

The Nairobi-headquartered African Virtual University (AVU) (http://www.avu.org) is a first-of-its-kind interactive-instructional telecommunications network established to serve the countries of sub-Saharan Africa. It is an experiment still in progress. It is sponsored by the World Bank with additional support from Britain, Canada and Australia (as part of its new Virtual Colombo Plan) and is designed to help make up for inadequacies in the existing university degree and diploma programs in anglophone and francophone sub-Sahara Africa, particularly in the fields of engineering, science, computer literacy and business management. It is conceived as an international portal, leveraging existing universities and other institutions, and promoting the emergence of new institutions for the sharing of digital satellite and computer-based instructional resources. It assists AVU campuses in upgrading their access to high speed Internet connectivity and making other ICT infrastructure improvements, it provides access to specialized teaching staff and a digital library, and it enables participants to tap into each others' ideas, knowledge and experiences

via AVU Interactive.

The AVU commenced pilot operations in 1997, and since that time, 26 AVU learning centres have been established in 15 sub-Saharan countries, some 3,500 hours of instructional programs have been delivered, over 24,000 students have been enrolled in the semester-long courses, 1,000 PCs have been installed in the learning centres, a digital library has been established with 2,000 full-text journals and a catalogue of subject-related Web links, and a Website created, which currently receives over one million hits per month and has over 15,000 active email accounts and other Web-based services. Eventually, AVU aims to serve significantly more students—up to 500,000.

AVU lectures are delivered at African university campuses, mainly by lecturers based in US and European universities via videoconferencing facilities in their classrooms. The students use e-mail, fax or the telephone to ask questions of their instructors, and local moderators run tutorials, set and mark exams and assignments, and perform other roles in the instructional process. AVU Interactive enables the participants to share their knowledge and ideas and join in discussion groups with experts and peers online.

The percentage of students earning pass grades in AVU's degree, non-credit, remedial and certification programs equals and sometimes exceeds those of conventional courses (Aguti 1998; Light 1999). AVU's funding is provided through student and institutional fees, foundation grants and contributions from private partners like multinational companies. By offering courses in so many countries, its aims to achieve economies of scale that will justify the initial investment. See also Diagne (2000).

Telecentres

It is not everyone who can access the new technology, afford it, know how to operate it, or know how to learn from it. One way of surmounting this problem in developing countries and the remote and rural areas of developed nations is to establish what are known as 'telecentres' or 'telecottages' (Latchem & Walker, 2001).

- Telecentres are community-managed ICT centres based in areas where it would otherwise be too difficult or expensive to provide wired, wireless or satellite connectivity and quality-assured portals to the global network, and where the people still need help in developing the attitudes, knowledge and skills required for the information age. They bring knowledge and technology to the socially and/or geographically disadvantaged, either by brokering programs and services with governmental, educational and private providers or by initiating these themselves. According to local needs and circumstances, they provide non-formal adult and community education.
- Counseling, enrolment, tutoring, library and study support and examination supervision for formal accredited study.
- In-service training for professionals and para-professionals, public sector employees, business and industry.
- ICT training to generate employment and business enterprise (e.g.,

in word processing, desktop publishing and printing, Web and multimedia design, software development, abstracting, editing, proofreading and indexing, data input, bookkeeping, accounting, and invoicing, operating call centres, etc., activities that may entail flexitime, part-time work and job sharing, and can be based in the telecentres or people's homes or places of work).

- Government and community information and online news services.
- Online discussion and working groups.

Telecentres are typically equipped with networked computers and software for word-processing, spreadsheets, databases and multimedia learning, printers, photocopiers, binders, laminators, telephones, fax, Internet access, radios, VCRs and television monitors. Some may also equipped with such items as CD burners /writers, scanners, data projectors and mobile phones.

The telecentre movement began in the 1980s in Scandinavia, and has since spread to North and South America, Europe, Africa and Australasia. Some telecentres are networked; some have links to satellite centres, 'tele-hubs' or mobile centres serving smaller communities within their regions; and some are purely standalone. Most of those in the developing world owe their origins to international donors such as UNESCO, the International Telecommunications Union (ITU), International Development Research Centre (IDRC) and US Academy for Educational Development (AED), or, in a minority of cases, to corporate donors such as Siemens, Sagem, Ericsson and DaimlerChrysler. In the case of Australia and Canada, the telecentres are federally or state government funded or supported by nongovernmental agencies (NGOs). The national partners in such initiatives are typically ministries of education and other government departments, universities, colleges, telecom providers and NGOs. The local partners are either community organizations or commercial managers who, beyond the pilot stage, are expected to be responsible for the management and funding of these centres.

Telecentres are still evolving and learning how best to serve their communities. Some are vibrant organizations pursuing their goals with creativity, enthusiasm and success. Others have yet to prove their worth or self-sufficiency. Providing the technology is one thing. Forming strong partnerships, harnessing community support, ensuring quality educational services and placing everything on a sound business foundation are quite another. A great deal depends upon the calibre of the telecentres' managers and staff. The managers must have good marketing, community liaison, entrepreneurial, financial and people management skills and the staff must be conversant with the philosophy and methods of distance learning, sensitive to the users' needs, and skilled in providing ICT training, support, and encouragement for community enterprise.

Technology

In choosing the technologies for such learning networks, it is important to consider the users' requirements, costs of acquiring, servicing and repairing the equip-

ment, phone and Internet access charges, system compatibility, and possibilities of sharing facilities, expertise and costs across organizations, sectors and even national borders.

Technology can enhance access, offer faster interaction and provide enriched learning environments. But of itself, it cannot empower those who lack the knowledge and skills to exploit it. Nor can it guarantee success in the learning outcomes. Much time and effort must be given to building awareness of, and competence in, technology and its educational applications through open-house demonstrations and ongoing training. Those who are less proficient may be partnered with the more experienced and those who are able and willing to learn independently or with minimal supervision may do so through self-tutoring programs or online.

Learning network technology can support virtually every aspect of distance learning:

- Educational opportunities and events can be publicized through print or electronic means.
- Lecture content can be delivered by means of transcriptions, audiocassette, videotape, CD-ROM, satellite or the Internet.
- Self-study material can be provided in print, online, CD-ROM or audiovisual learning packages.
- Interactive lectures and seminars, enabling learners to question and be questioned on their reading and assignments, can be provided via audioconferences and videoconferences.
- Assignment writing can be facilitated by the drafting and redrafting capabilities of the computer and assignment delivery and feedback speedily, cheaply and reliably achieved via the Web.
- Tutorials and peer learning can be provided through audio-conferencing, chat rooms, computer conferencing, or videoconferencing.
- Library and database searches can be facilitated through CD-ROMs and the Web, and library and interlibrary loans through email.
- Practical work and research can be carried out using computer- and Internet-based simulations and case-based teaching and learning tools offering animation, hypertext, diagnostic networks and so forth.

Technology can be used to import the best courses and course materials, reduce feelings of isolation in the learners and create virtual learning communities. However, there are always technological, cost and equity issues to be borne in mind. There are also the all-important human factors. Online interaction, being asynchronous, may suit those who can only log on at particular times but the group dynamics and pacing are quite different from face-to-face interaction and some learners will need reassurance that they are on the right lines and that any doubts or confusion they may experience are an inevitable part of the learning process.

Cost

There is an expectation in most countries today that the institutions and

the learners rather than the governments and the taxpayer should bear all or most of the costs of education and training. Funding issues take on a particular significance in poorer countries and communities and one of the greatest challenges is how to achieve financial sustainability in learning networks. Whether seed funded from public or private sources or operating as public-private partnerships, learning networks need sound business and financial planning to ensure that they can meet the ongoing costs of salaries, consumables, telecommunications charges, and equipment maintenance, replacement and upgrading, in order to break even or even show a profit within a reasonable timeframe. In so doing, they need to strike a balance between cost recovery for self-sufficiency, and affordability for maximum participation, altruism and commercial imperatives.

Judging the success of learning networks

Formative and summative evaluation is needed to ensure that learning networks are developing in the right ways and having the desired effects. It is vitally important to conduct surveys, organize focus groups, seek feedback from the users and providers, and monitor costs and usage. These are crucial in determining the extent to which such networks are cultivating responsive links with, and meeting the needs and expectations of, the stakeholders, and fostering lifelong learning, ICT competence and a capacity for self-development and change.

Conclusion

Education and training represent a sound investment, both for the individual and society. The examples given above serve to demonstrate the great scope and need for governments, public institutions, the private sector and NGOs to seize on the opportunities provided by ICT for collaborative development, at the regional, national and international levels.

Learning networks are essentially about linking people with the people, knowledge and resources they need without recourse to physical proximity. They can enable people to take advantage of a greater range of educational opportunities, gain access to up-to-date ideas and material, have virtual access to those they wish to collaborative with, and become part of a learning community, even at a global level. By the very nature of their interactivity, they offer far more than the mere transmission of information—they facilitate the sharing of experiences, ideas and feelings and the transmission of cultural and social paradigms between and among groups and individuals.

Experience shows that the effectiveness and efficiency of learning networks depend upon their having:

- High level political support.
- Recognition of the value of e-learning by employers, employees and the wider community.
- Responsiveness to the prevailing public policies in education, training and lifelong learning and the opportunities for public-private partnership.
- A developmental rather than a tech-

nological focus.

- Strong leadership and sound management.
- Clearly defined target groups, users' needs, and measurable goals and performance standards agreed to by the members
- Sound business plans and management.
- Strong partnerships with government, NGOs, educational and training providers, and business.
- An online social structure that can underpin socio-economic and educational development.
- Welcoming, user-friendly service and connections between participants.
- Policies and procedures that embrace action research, mentoring for change, and the principles of adult learning.
- Professionally trained e-learning support personnel and facilitators.
- A good infrastructure connected in a unified, coherent and innovative national or regional system for educational and social reform.
- Well-maintained, robust, and user-friendly technology.
- Stable and reliable telecommunications and power supply.
- Affordable programs and services matched to community needs.
- Ongoing monitoring of programs, services, costs, revenue and usage, and
- Regular accountability reports to stakeholders.

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